BLG 3/5/...
26 March 1997

SUB-COMMITTEE ON BULK LIQUIDS
AND GASES
3rd session
Agenda item 5

REVISION OF MARPOL REGULATIONS I/22-24 IN THE LIGHT OF THE PROBABILISTIC METHODOLOGY FOR OIL OUTFLOW ANALYSIS

A Proposed Cargo Tank Size and Arrangement Parameter for New Double Hull Tankers

Submitted by the United States

SUMMARY

Executive summary: This paper proposes a standard for a cargo tank size and arrangement parameter for new double hull tankers in the light of the revisions of MARPOL Regulations I/22-24.

Action to be taken: Consider the proposal in paragraph 4.

Related documents: BLG 3/5 (Report of the Working Group at BLG 2 (Part 2)), BLG 3/5/1 (Report of the Correspondence Group)

Introduction and Background

1 The BLG Sub-Committee is revising regulations I/22-24 of MARPOL 73/78. In this regard, at the 2nd session of the Sub-Committee, a Working Group was established that developed a draft regulation to replace regulations I/22-24. Regulations 22-24 were primarily intended as a means of establishing the cargo tank size and arrangements on single hull tankers. This draft regulation is contained at Annex I to BLG 3/5 (Report of the Working Group at BLG 2 (Part 2)), and includes a methodology for using the oil outflow from accidental collisions and groundings as a performance basis to set the internal tankage configuration for new double hull tankers.

2 The two parameters that could be available from the calculation process (contained in the draft regulation) are: (1) mean oil outflow, and (2) the probability of zero outflow. The probability of zero outflow parameter for any double hull tanker is entirely dependent on the design of its double side and double bottom spaces, whereas the mean outflow parameter is primarily dependent on the subdivision of the cargo block, as well as the design of the double hull spaces. The minimum standards for design of the 'tween hull spaces for double hull tankers are contained in Regulations 13E and 13F. Further, the existing Regulations 22-24 for setting the cargo tank size and configuration, were intended to be applied for single hull tankers. It has been

recognized that there is a significant variation of the mean outflow characteristics of double hull tankers. The proposed standard will eliminate this significant variation, by setting performance standards for subdivision of the cargo block.

A Proposal for a cargo tank size and arrangement parameter for new double hull tankers

3 The United States invites the Sub-Committee to consider the proposal that the cargo tank size and arrangement parameter for new double hull tankers, "CT_{DH}" (with reference to paragraph 3 of the proposed regulation contained at annex of BLG 3/5), be defined as a function of the mean oil outflow and cargo carrying capacity.

4 The proposed new text for paragraph (3) of the draft regulation as contained in Annex I to BLG 3/5 is as follows:

The level of protection against oil pollution in the event of collision or stranding shall be determined by calculation of the cargo tank size and arrangement parameter, $CT_{DH,}$

$$CT_{DH} = O_M / C,$$

such that,

$$CT_{DH} \leq 0.016, \quad \text{for } C \leq 200{,}000 \text{ m}^3,$$

$$CT_{DH} \leq (0.01 + (0.006/200{,}000) \times (400{,}000 - C)), \quad \text{for } 200{,}000 \text{ m}^3 < C < 400{,}000 \text{ m}^3,$$

and

$$CT_{DH} \leq 0.0100, \quad \text{for } C \geq 400{,}000 \text{ m}^3$$

where,

O_M = mean oil outflow parameter, in cubic meters,

C = total volume of cargo oil, in cubic meters, at 98 % tank filling.

5 The proposed minimum standard for a cargo tank size and arrangement parameter for new double hull tankers, CT_{DH}, is shown as the dashed line in Figure 1. Also, plotted in Figure 1 are the values of O_M / C for a range of notional double hull designs, together with the values for the IMO "Reference" double hull designs. The notional double hull designs are described in the following paragraphs.

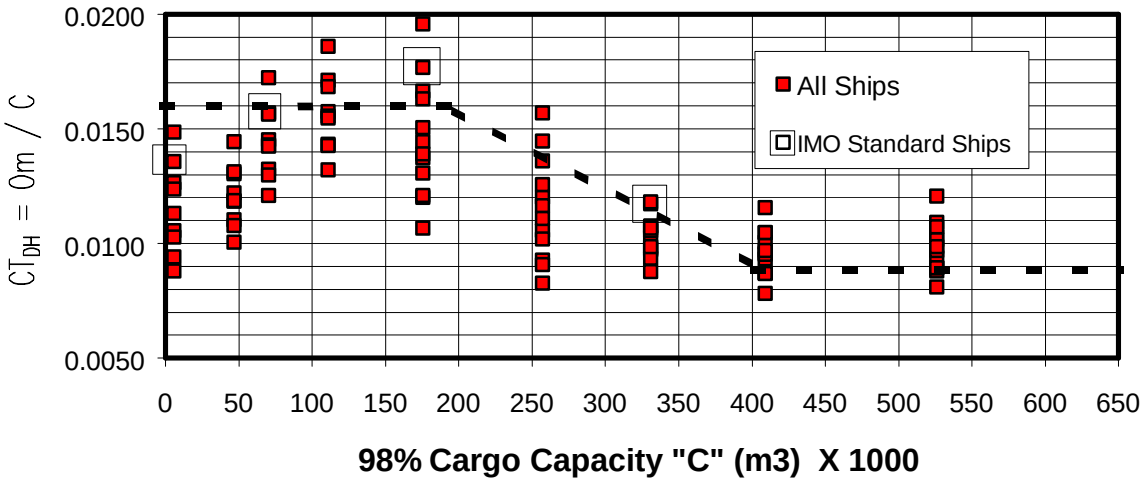

Figure 1
"CT_{DH}" Values for Various Double Hulls

Double Hull Designs Evaluated

6 A matrix representing the 96 designs evaluated in this study is presented in Table 1. Within each size range, the cargo tank configurations were evaluated with each of the three assumed double hull dimensions. The four reference designs from the *IMO Guidelines* for evaluating alternatives to double hull tankers are highlighted with bold text.

	Cargo Deadweight at 98% Filling (MT)								
	5,000	40,000	**60,000**	100,000	**150,000**	220,000	**283,000**	350,000	450,000
Wing Tk. Width	**1.0 x 1.1**	2.0 x 2.0	**2.0 x 2.0**	2.0 x 2.0	**2.0 x 2.32**	2.5 x 2.5	**4.0 x 2.0**	3.0 x 3.0	3.0 x 3.0
x D.B. Height	1.25 x 1.25	2.25 x 2.25	2.25 x 2.25	2.5 x 2.5	2.5 x 2.5	3.0 x 3.0	3.0 x 3.0	3.5 x 3.5	3.5 x 3.5
(m x m)	1.5 x 1.5	2.5 x 2.5	2.5 x 2.5	3.0 x 3.0	3.0 x 3.0	3.5 x 3.5	3.5 x 3.5	4.0 x 4.0	4.0 x 4.0
Cargo Tank	5 x 2	5 x 2	5 x 2	5 x 2	5 x 2	6 x 2	**5 x 3**	5 x 3	5 x 3
Arrangement	**6 x 2**	6 x 2	**6 x 2**	6 x 2	**6 x 2**	7 x 2	6 x 3	6 x 3	6 x 3
(Long'l x	7 x 2	7 x 2	7 x 2	7 x 2	7 x 2	5 x 3	5 x 4	5 x 4	5 x 4
Transverse)					5 x 3	6 x 3	5 x 5	5 x 5	5 x 5
No. of Designs	9	9	9	9	12	12	12	12	12

Table 1
Matrix of Ship Sizes and Configurations

7 All IMO reference ships fall within the proposed standard except the 150,000 DWT (SUEZMAX) design. The reference ship has a 6x2 tank arrangement with a 2.0 m wing tanks and 2.32 m double bottom. In order to satisfy the proposed standard, and increase in the wing tank and double bottom dimensions to about 2.4 m x 2.4 m is required. As illustrated in Figure 2 and Figure 3, most of the SUEZMAX tankers constructed in recent years have clearances exceeding 2.4 m. This is primarily due to structural and access considerations.

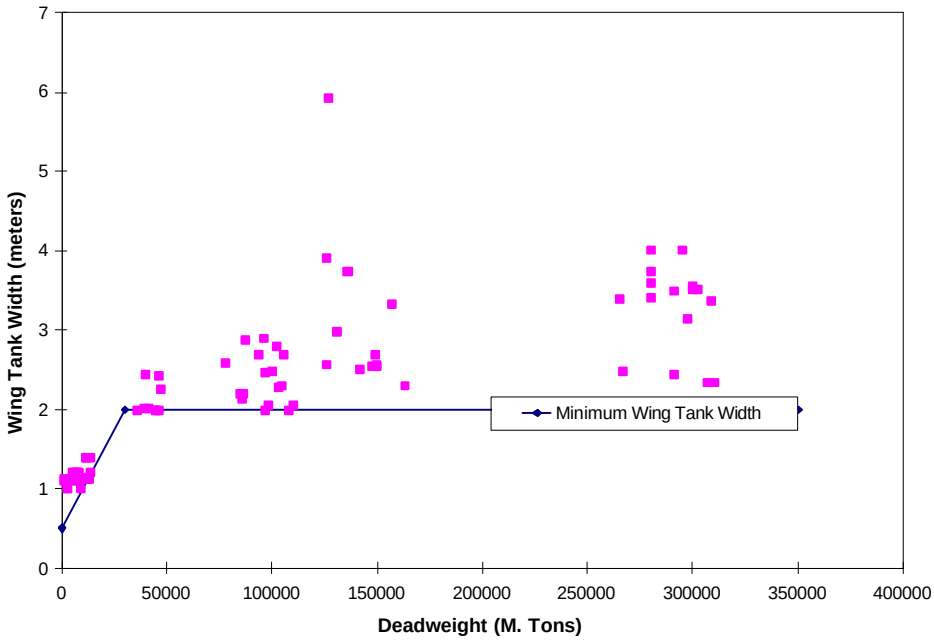

Figure 2
Wing Tank Width (for Recent Double Hull Tankers)

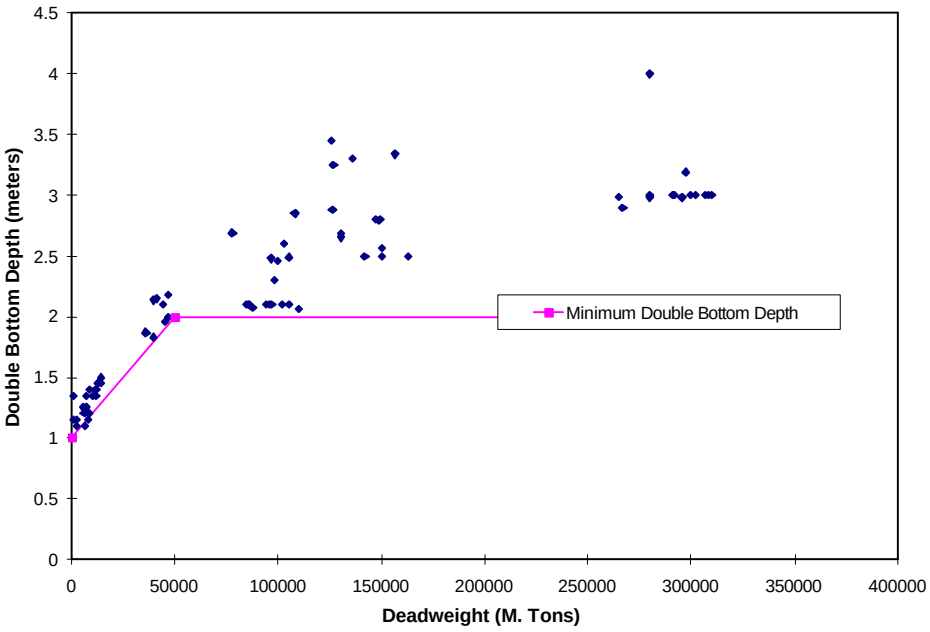

Figure 3
Double Bottom Depth (for Recent Double Hull Tankers)

Anticipated impact of this proposed standard

8 The anticipated impacts of this proposed standard are:

- The standard will likely eliminate future tankers with "single tank across" cargo tanks. For instance, a 40,000 DWT tanker with a 7x1 cargo tank arrangement would require 4.25 m deep wing tanks and double bottoms in order to satisfy this proposed outflow standard. It should be noted that, due to intact stability as well as outflow considerations, few (if any) "single tank across" tankers are under construction today.

- AFRAMAX tankers (about 95,000 DWT) with minimum 2m x 2m double hull dimensions will need a 7x2 or greater cargo tank subdivision. The double hull dimensions must be approximately 2.3 m or perhaps 2.4 m if a 6x2 cargo tank arrangement is used.

- Most SUEZMAX tankers under construction utilize a 6x2 (or greater) cargo tank subdivision, and 2.4 m or greater double hull dimensions. The proposed standard will not influence these designs. It will eliminate the occasional design built to minimum double hull dimensions.

- Most VLCC's under construction utilize a 5x3 (or greater) cargo tank subdivision, and 3m or greater double hull dimensions. The proposed standard will not influence these designs. It will eliminate the occasional design built with wing tank clearances below about 2.8 m.

Thus, the proposed standard will effectively eliminate "single tank across" arrangements, which have been shown to exhibit poor outflow characteristics. It will also influence double hull dimensions for some AFRAMAX (and larger) designs. However, most tankers under construction today can meet the proposed standard.

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